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supported 704a, 704b, 704c end cap 706, or may be provided with rollers or roller bearings 502a, 502b, 502c, or a bracket engaging a race or annular recess 504, or other bearing surface 708. If desired, one or more rollers 502a may be pivotable or spring loaded 524, e.g., to accommodate installation or removal of the cylinder 318, e.g., for maintenance, repair, inspection, and the like. It is particularly desirable that the tumbler be configured for ease of removal so that it can be easily cleaned or replaced or jams may be cleared.

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On page 14, starting at line 28 and continuing through page 15, line 8:

In one embodiment a low back-pressure air transfer system may be used. In this system, a fan is mounted adjacent the coin-exit end of the tumbler 344, and a suction hose is positioned adjacent the coin-input end 342. The intake end of the suction hose may be screened or filtered to avoid damage to fans or other devices that power of the suction. Preferably there is little back pressure in the system and a relatively large amount of air is moved through as the coins are tumbled. In one embodiment the perforated cylinder 318 is enveloped and sealed with a housing to assist in directing air flow in the desired counter-current direction 334. The housing may be in the form of a semi-cylinder covering which seals with a waste removal tray 338. Such a housing preferably also is useful in diminishing or deadening the noise of the tumbler device.

In one embodiment the system is substantially modular such as being contained, along with a feed tray 1402, in a rectangular or other modular housing. Preferably the modular design is configured to accommodate retrofitting in devices which do not currently have a tumbler. For example, a device such as that depicted in Fig. 1 may be retrofitted by removing the rectangular housing depicted in Fig. 2 and replacing with the rectangular modular unit of Figs. 8 through 11. In one embodiment the tubular tumbler is formed from two semi-cylindrical mating polyurethane components.

## REMARKS

Claims 1-46, 50-56, 59 and 60 are currently pending in the present application. The Specification has been amended solely to correct clerical errors or improve readability, and corrected Figures 1, 2, 6, 7A, 9, 12-16 and 18 are included with the Request for Drawing Change submitted with this response.

In the Office Action mailed October 11, 2001, claims 1-14, 18, 19, 23-31, 33, 35-38, 42-46, 50-56, 59 and 60 were rejected and claims 15-17, 20-22, 32, 34 and 39-41 were allowed. More specifically, the status of the application in light of this Office Action is as follows:

- (A) Figures 6, 7A, 14, 15, 16 and 18 were objected to for containing discrepancies;
- (B) Figures 1, 2, 5, 7A-9, 12 and 13 were objected to as failing to comply with 37 C.F.R. 1.84(p)(5) by including reference signs not mentioned in the description;
- (C) The Abstract of the Disclosure was objected to for including features not referred to in the Specification;
- (D) Pages 2, 3, 5, 7, 9, 10, 11, 13, 14 and 15 of the disclosure were objected to because of informalities;
- (E) Claims 1-10, 12-14, 18, 19, 23-31, 33, 35-38, 43-46, 50-56, 59 and 60 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over U.S. Patent No. 5,842,916 to Gerrity, et al. ("Gerrity '916") and U.S. Patent No. 6,174,230 to Gerrity, et al. ("Gerrity '230");
- (F) Claims 11 and 42 were rejected under 35 U.S.C. § 112, first paragraph; and
- (G) Claims 15-17, 20-22, 32, 34 and 39-41 were allowed.

The undersigned attorney wishes to thank the Examiner for engaging in a telephone conference on January 14, 2002, to discuss the present Office Action. The following remarks reflect the agreement reached between the Examiner and the undersigned attorney during the January 14th telephone conference in regard to the 35 U.S.C. § 112, first paragraph, rejection of claims 11 and 42.

A. Response to the Objection to Figures 6, 7A, 14, 15, 16 and 18 Based on Discrepancies

Figure 6 was objected to because the lead line of reference number 504 allegedly points to an incorrect element. A corrected Figure 6 showing the reference number 504 pointing to a race or annular recess, as described at line 33 on page 13 of the

Specification, has been provided in the Request for Drawing Change submitted in response to this Office Action.

Figure 7A was objected to for allegedly being mislabeled. A corrected Figure 7 labeled "Figure 7" instead of "Figure 7A" has been provided in the Request for Drawing Change submitted in response to this Office Action.

Figure 14 was objected to because the directional arrow was allegedly mislabeled as "1384" when it should have been labeled "1385." A corrected Figure 14 showing the directional arrow labeled as 1385 has been provided in the Request for Drawing Change submitted in response to this Office Action.

Figure 15 was objected to because the directional arrow was allegedly mislabeled "1368" when 1368 should refer to the frame. A corrected Figure 15 identifying the frame as 1368 and eliminating the reference to the directional arrow has been provided in the Request for Drawing Change submitted in response to this Office Action.

Figure 16 was objected to because items 1614[a] and 1612a were allegedly labeled twice, because items 1614d and 1612d were allegedly not labeled at all, and because items 1614b was allegedly not labeled and not shown. A corrected Figure 16 that replaces one of the reference numbers 1614[a] with reference number 1614d and one of the reference numbers 1612a with 1612d has been provided in the Request for Drawing Change submitted in response to this Office Action. In addition, the corrected Figure 16 shows element 1614b and labels it appropriately.

Figure 18 was objected to because elements 1814b and 1814c were allegedly not shown or labeled. A corrected Figure 18 with partial cutaways showing elements 1814b and 1814c correctly labeled has been provided in the Request for Drawing Change submitted in response to this Office Action.

Applicants respectfully submit that upon entry of the Request for Drawing Change submitted in response to this Office Action the discrepancies noted by the Examiner on Figures 6, 7, 14, 15, 16 and 18 will be corrected. Accordingly, this objection should be withdrawn.

B. Response to the Objection to Figures 1, 2, 5, 7A-9, 12 and 13  
Under 37 C.F.R. 1.84(p)(5)

Figure 1 was objected to because the reference numbers 1602, 1606a, 1606b, 1622, 1624, 1626, 1632 and 1882 shown in the figure were allegedly not mentioned in the description. A corrected Figure 1 without these reference numbers has been provided in the Request for Drawing Change submitted in response to this Office Action.

Figure 2 was objected to for including reference numbers 1440 and 1432 which allegedly are not mentioned in the description. A corrected Figure 2 without reference number 1440 has been provided in the Request for Drawing Change submitted in response to this Office Action. Applicants respectfully disagree with the Examiner's assertion that reference number 1432 is not mentioned in the description. Applicants direct the Examiner's attention to page 3, line 29: "... for movement past *a gate 1432*, ..." Accordingly, removal of reference number 1432 from Figure 2 is not required.

Figure 5 was objected to for including reference number 316 which allegedly was not mentioned in the description. Applicants respectfully disagree with the Examiner's assertion that reference number 316 is not mentioned in the description, and would like to direct the Examiner's attention to page 12, line 5: "... and via *chute 316* ..." Accordingly, removal of reference number 316 from Figure 5 is not required.

Figures 7A and 8 were objected to for including reference number 316 which allegedly was not mentioned in the description. In fact, reference number 316 is not included on either Figure 7 or Figure 8. Accordingly, no correction to Figures 7 and 8 in this regard is required.

Figure 9 was objected to for including reference number 812 which allegedly is not mentioned in the description. A corrected Figure 9 without reference number 812 has been provided in the Request for Drawing Change submitted in response to this Office Action.

Figure 12 was objected to for including reference numbers 402b, 402c, and 402d which allegedly are not mentioned in the description. A corrected Figure 12 without the reference numbers 402b, 402c and 402d has been provided in the Request for Drawing Change submitted in response to this Office Action.

Figure 13 was objected to for including reference number 1414 which allegedly was not mentioned in the description. Applicants respectfully disagree with the Examiner's assertion that reference number 1414 is not mentioned in the description, and would like to direct the Examiner's attention to page 3, line 28: "... over the *ridge or peak 1414*, . . ." Accordingly, no correction to Figure 13 in this regard is required.

Applicants respectfully submit that Figures 1, 2, 5, 7A-9, 12 and 13 will comply with 37 C.F.R. 1.84(p)(5) upon entry of the Request for Drawing Change submitted in response to this Office Action. Accordingly, this objection should be withdrawn.

**C. Response to the Objection to the Abstract of the Disclosure**

The Abstract of the Disclosure was objected to for allegedly including features not referred to in the Specification. Specifically, the features of "a blower or vacuum" in line 4 [8] and "the air pressure system" in line 14 are allegedly not referred to in the Specification. Applicants respectfully traverse this objection to the Abstract because both these features are referred to in the Specification. For example, on page 14 at lines 19-22, the Specification discloses "*in one embodiment, the apparatus is configured to provide a flow of air or other fluid past the contents of the tumbler to assist in removing lighter and low-density non-coin material. Air flow devices may include a positive pressure device, a negative pressure or vacuum device, or both . . .*" Similar references to a blower (i.e., a "positive pressure device") and a vacuum are provided on page 15 at lines 17-27. Accordingly, the references to a blower, vacuum, and air pressure system in the Abstract of the Disclosure are supported by the Specification and this objection should be withdrawn.

**D. Response to the Objection to the Disclosure Based on Informalities**

Page 2 of the disclosure was objected to for being provided with an insufficient margin; and page 3 was objected to for being partially obliterated. Accordingly, clean text for pages 2 and 3 is included with the amended Specification paragraphs provided with this response.

Page 5 was objected to because the reference to "solonoid 1325" at line 9 should allegedly refer to "solonoid 1326." Line 9 on page 5 has accordingly been amended to replace "1325" with "1326."

Page 7 was objected to because the reference to "dimples 18" at line 20 should allegedly refer to "dimples 1820." Line 20 on page 7 has accordingly been amended to replace "18" with "1820."

Line 21 on page 7 was also objected to because the reference to the "trommel 1313" should allegedly refer to the "trommel 1314." Line 21 on page 7 has accordingly been amended to replace "1313" with "1314."

Page 9 was objected to because the reference to "1940d" at line 7 is allegedly not shown in the drawings. Line 7 on page 9 has accordingly been amended to delete "1940d."

Page 10 was objected to because the reference to "withdrawn 1368" at line 5 allegedly does not follow. Line 5 on page 10 has accordingly been amended to delete "1368."

Page 10 was objected to because the references to "springs 1374a, 1374b" were allegedly misnumbered. Line 7 on page 10 has accordingly been amended to replace "1374a, 1374b" with "1378a, 1378b."

Page 10 was objected to because the reference to "1309" at line 10 should allegedly be "1308." Line 10 on page 10 has accordingly been amended to replace "1309" with "1308."

Page 10 was objected to because the reference to "pins 1322" at line 11 should allegedly refer to "pins 1322a and 1322b." Applicants would like to respectfully point out that the clerical error cited by the Examiner in fact appears on page 11, at line 11, and not on page 10. Accordingly, line 11 on page 11 has been amended to replace "1322" with "1322a and 1322b."

Page 10 was objected to because the reference to "collapsed 1385" at line 15 allegedly does not follow. Line 15 on page 10 has accordingly been amended by inserting the words "in a direction" between the existing words "collapsed" and "1385."

Page 10 was further objected to because the reference to "lip 1382" at line 28 was allegedly misnumbered. Line 28 on page 10 has accordingly been amended to delete the reference to "1382."

Page 11 was objected to because the reference to "trommel assembly 1368" at line 31 should allegedly refer to "1338." Line 31 on page 11 has accordingly been amended to replace "1368" with "1338."

Page 13 was objected to because the reference to "Fig. 9" at line 32 should allegedly refer to "Fig. 7." Line 32 on page 13 has accordingly been amended to replace "Fig. 9" with "Fig. 7."

Page 14 was objected to because the reference to "cylinder 326" should allegedly refer to "328." Applicants respectfully disagree with the Examiner and contend that the reference to "cylinder 326" should in fact refer to "cylinder 318." Accordingly, line 32 on page 14 has been amended to replace "326" with "318."

Page 15 was objected to because the reference to "housing" at line 4 is allegedly misnumbered as "313" [312]. Line 4 on page 15 has accordingly been amended to delete the reference to "312."

Applicants respectfully submit that the foregoing amendments to the Specification remove the informalities cited in this Office Action. Accordingly, this objection should be withdrawn.

#### E. Response to the Double Patenting Rejection

Claims 1-10, 12-14, 18, 19, 23-31, 33, 35-38, 43-46, 50-56, 59 and 60 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over various claims of the Gerrity '916 and Gerrity '230 patents. The cited conflicting patents are commonly owned with this application, and applicant has timely filed a terminal disclaimer in compliance with 37 C.F.R. 1.321(c) to overcome this rejection. Therefore, this rejection should be withdrawn.

F. Response to the Rejection of Claims 11 and 42 Under 35 U.S.C.  
§ 112, First Paragraph

Claims 11 and 42 were rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which allegedly was not described in the Specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 11 is directed to an apparatus in a coin discriminating device that includes a container and a driver coupled to the container so as to move the container and agitate a plurality of coins. In claim 11, the driver is coupled to the container to pivot the container about at least a first axis. Applicants respectfully disagree with the Examiner's assertion that "the tilting operation of the container described in claim 11 (is) not mentioned in the Specification." Specifically, applicants would like to respectfully direct the Examiner to line 9 on page 17 of the Specification: "in addition to, or in place of, moving coins by providing a rotatable cylinder, other types of movement of the tubular or concave surface may also be used for moving or agitating the coins, *such as a rocking or tilting motion*, a swinging motion, a vibrating motion, and the like." Applicants submit that the reference to "tilting motion" on page 17 is sufficient to enable one skilled in the art to make and/or use the invention. Accordingly, the rejection of claim 11 should be withdrawn.

Claim 42 is directed to an apparatus in a coin discriminating device that includes a container and a means for flowing air through the container. Applicants respectfully disagree with the Examiner's assertion that "the air flow system of claim 42 (is) not mentioned in the Specification." Specifically, applicants would like to direct the Examiner's attention to lines 19-25 on page 14 of the Specification: "In one embodiment, the apparatus is configured *to provide a flow of air* or other fluid past the contents of the tumbler to assist in removing light and low-density non-coin material. *Air flow devices may include a positive pressure device, a negative pressure or vacuum device, or both, . . .*" Further, referring to line 28 on page 14: "In one embodiment, a low back-pressure air transfer station may be used. In this system, *a fan is mounted adjacent to the coin-exit end of the tumbler 344, . . .*" Further still, referring to line 23 on page 15: "The apparatus may include a device configured *to direct air flow* in a direction counter-current to at least a first direction of coin movement . . . The apparatus may include *a positive pressure device* for

*causing air flow through said coin conditioner. The apparatus may include a vacuum device for providing air flow through said coin conditioning.*" Accordingly, applicants submit that the Specification is replete with references to air flow systems sufficient to enable one skilled in the art to which it pertains to make and/or use the invention. Accordingly, the rejection of claim 42 should be withdrawn.

In light of the foregoing amendments and remarks, all of the pending claims are in condition for allowance. Applicants, therefore, request reconsideration of the application and an allowance of all pending claims. If the Examiner wishes to discuss the above-noted distinctions between the claims and the cited references, or any other distinctions, the Examiner is encouraged to contact Stephen E. Arnett by telephone. Additionally, if the Examiner notices any informalities in the claims, he is also encouraged to contact Stephen E. Arnett to expediently correct any such informalities.

Respectfully submitted,

Perkins Coie LLP



Stephen E. Arnett  
Registration No. 47,392

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Enclosures:

- Postcard
- Check
- PTO-1083 (+ copy)
- Appendix (Marked-up version of specification)
- Authorization for Extensions of Time
- Petition for Extension of Time (+ 2 copies)
- Terminal Disclaimer
- Request for Approval of Drawings Changes with redlined changes
- 15 Sheets of Formal Drawings (Figures 1-21)

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**APPENDIX – SPECIFICATION**  
**MARKED TO SHOW CHANGES**

On page 2, starting at line 1 and continuing through page 3, line 34:

**SUMMARY OF THE INVENTION**

The present invention provides for separating non-coin objects from coins in a coin-sorting, discriminating or counting device, preferably prior to coins reaching certain coin transport devices, such as transport devices for transporting coins toward a hopper or sensor, preferably prior to coins reaching a coin hopper which provides coins to sensors and preferably prior to the coins reaching the counter/sorting sensors. In one embodiment the separation device is a generally tubular or concave surface, having one or more openings through which non-coin objects travel, and which cause coins introduced thereto to undergo relative movement to assist in separation of non-coin objects. In one embodiment, the relative movement preferably involves lifting some coins with respect to others and may be achieved by pivoting or rotating the tubular or concave surface, e.g., about an axis. Agitation may be further enhanced by projections formed in or attached to the surface, such as vanes, fins, blades, spines, dimples, ridges, and the like. Movement of coins through or across the tubular or concave surface may be effected or enhanced by various mechanisms. Although gravity feed may be used, in one embodiment blades such as angled, spiral or helical blades assist in moving the coins e.g. in a screw conveyor fashion.

Except for coin entrance and exit ports, diameters, sizes or shapes of the openings are configured to prevent passage therethrough of the smallest coin intended to be counted by the counting device. In one embodiment, a drive mechanism rotates the cylinder about its longitudinal axis to agitate the coins therein by lifting coins and, preferably, moving the coins through the cylinder by a screw mechanism.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 is a perspective view of a coin-counting device of a type which may be configured to incorporate features of the present invention;



Fig. 2 is a rear perspective view of a receiving tray and rib slide of a type which may be provided in the apparatus of Fig. 1;

Fig. 3 is a schematic side view of a feed tray and tumbler device according to an embodiment of the present invention;

Fig. 4 is a schematic depiction of the position of a helical blade in an embodiment of the present invention;

Fig. 5 is a partial side view of a tumbler device according to an embodiment of the present invention;

Fig. 6 is an end view of a tumbler device according to an embodiment of the present invention;

Fig. 7 is a partial perspective view, partially exploded, of a tumbler device according to an embodiment of the present invention;

Fig. 8 is a partial perspective view, partially exploded, of a tumbler device according to an embodiment of the present invention;

Fig. 9 is a rear perspective view of a modular feed tray/tumbler device according to an embodiment of the present invention, which may be incorporated into the apparatus of Fig. 1;

Fig. 10 is a side view of the apparatus of Fig. 9;

Fig. 11 is an end perspective view of the apparatus of Fig. 9;

Fig. 12 is an end view of a tumbler cylinder, according to an embodiment of the present invention;

Fig. 13 is a front perspective view, with exploded cover plate, of an apparatus according to an embodiment of the present invention;

Fig. 14 is a front perspective view, partially exploded, of the apparatus of Fig. 13;

Fig. 15 is a rear perspective view, partially exploded, of the apparatus of Fig. 13;

Fig. 16 is a perspective view, partially exploded, of a trommel assembly, according to an embodiment of the present invention;

Fig. 17 is a perspective view of a first end cap which may be used in connection with an embodiment of the present invention;

Fig. 18 is a perspective view of a trommel body, according to an embodiment of the present invention;

Fig. 19A - D are right side elevational, top plan, left side elevational and end views of a trommel body in open configuration, according to an embodiment of the present invention;

Fig. 19E is a side view of a vane which may be used in connection with an embodiment of the present invention;

Fig. 20 is a perspective view of a long object trap of a type which may be used in connection with an embodiment of the present invention; and

Fig. 21 is a cross sectional view taken along line 21 – 21 of the device of Fig. 20.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Fig. 1 depicts a coin-counting device which may incorporate features of the present invention. Fig. 1 depicts a device in perspective with various doors opened, and a bag trolley 1610a partially withdrawn. In the embodiment of Fig. 1 a coin tray 1402 is mounted pivotally about axis 1414 (Fig. 2), so that a user, after inserting coins in the tray 1402 may lift the tray, using handle 1404, to move coins out of the tray area 1424, over the ridge or peak 1414, and onto a slope 1428, for movement past a gate 1432, and onto a ribbed chute 1406. Coins are moved into a hopper 1604 for transfer to a counter or sorter 1212, where sorted or counted coins are diverted to bins or, in the embodiment of Fig. 1, bags 1608 held in the trolley 1610a, 1610b. Information processing and/or communication devices and/or printers or dispensers 1628, 1874, which may include, e.g., a computer and/or printer may be provided for outputting information about the sorted coins or counted coins, as described, for example, in PCT application PCT/US95/05356 filed May 1, 1995, and/or U.S. application 08/255,539 filed June 6, 1994, both of which are incorporated herein by reference.

On page 5, starting at line 6 and continuing through line 16:

A controllable gate 1324 is mounted transverse to the first chute 1310 to permit rotation from the closed configuration depicted in Fig. 15, blocking passage of coins, to an open configuration permitting passage of coins or other objects past the gate. Preferably the gate 1324 is formed of rubber, e.g., to avoid pinching of fingers. Rotation of the gate 1324 is controlled by a solenoid 1326. The solenoid 13251326 is activated in response to a signal from a control device such as a computer or other information processing device 1628, 1874 (Fig. 1). The gate may be controlled to open or close for a number of purposes, such as in response to sensing of a jam, sensing of load in the trommel or hopper, and the like. In the depicted embodiment, signal devices such as LED or other lights 1328a, 1328b, can provide a user with an indication of whether the gate 1324 is open or closed (or otherwise to prompt the user to feed or discontinue feeding coins or other objects). Although instructions to feed or discontinue may be provided on the computer screen (Fig. 1), indicator lights 1328 are believed useful since users often are watching the throat of the chute 1310, rather than the computer screen, during the feeding of coins or other objects.

On page 7, starting at line 20 and continuing through line 28:

In the depicted embodiment dimples 181820 are formed protruding slightly into the interior region of the trommel 13131314. The dimples 1820 are believed to facilitate throughput by avoiding adhesion (such as surface tension – induced adhesion) and/or friction between coins and the interior surface of the trommel. The dimples are believed to reduce the likelihood of adhering a customer's coins to the trommel wall, resulting in loss of credit to the customer. It is believed the dimples prevent or reduce surface-to-surface contact of coins with an interior surface of the trommel over a substantial region of the coin face surface and, accordingly, in the depicted embodiment, dimples 1820 are positioned in any location of the interior surface where a flat region of substantial area would otherwise occur (such as regions between holes). Other shapes, sizes, locations and distributions of protrusions, ridges, fingers, and the like may also be useful to facilitate throughput.

On page 8, starting at line 29 and continuing through page 9, line 14:

Another feature which is believed to contribute to the desired lifting/free-fall behavior of the coins or other objects is a provision of one or more vanes protruding into the interior of the trommel 1922a, 1922b, 1922c, 1922d, 1924a, 1924b, 1924c, 1926a, 1926b, 1926c, 1926d, 1928a, 1928b, 1928c, 1928d. It is believed that by positioning vanes at an angle such as about 15° 1930 to a plane passing through the longitudinal axis 1932, the vanes assist not only in providing coin-lifting/free-fall, but also assist in moving the coins in a direction towards the output region 1308. Although it would be possible to provide one or more vanes whose lateral position (with respect an interior surface of the trommel) changed monotonically, it is believed such configuration is not as effective in assisting with movement of coins towards the output portion 1308, as a configuration in which the lateral position of the vane changes non-monotonically. In the depicted embodiment this is accomplished by providing the vanes in several subparts or segments, defining discontinuities or nodes at longitudinal positions 1936a, 1936b, 1936c, 1938a, 1938b, 1940a, 1940b, 1940c, ~~1940d~~, 1942a, 1942b, 1942c therebetween. Without wishing to be bound by any theory, it is believed that a configuration in which the nodes for adjacent sides of the trommel are at similar longitudinal positions does not promote the desired transport of coins towards the output end 1308. Accordingly, the nodes 1936a, 1935b, 1936c, 1938a, 1938b, 1940a, 1940b, 1940c, 1942a, 1942b, 1942c, are perfectly configured such that nodes defined on one surface are at longitudinal positions different from the node positions for an adjacent surface and, preferably, different from node positions for all other surfaces, as depicted. In the depicted embodiment, eleven of the fifteen vane segments are the same length (about 2.7 inches or about 6.8 cm in the depicted embodiment), with the desired node offset resulting in the remaining segments 1922a, 1922d, 1926a, 1928d being shorter.

On page 10, starting at line 3 and continuing through line 29:

The output bearing 1360 is held in position by an end wall 1366. In the depicted embodiment, the end wall 1366 is mounted to the frame 1368 so as to permit the end wall 1366 to be moved so as to allow the trommel assembly 1338 to be withdrawn ~~1368~~, e.g., for cleaning or maintenance. In the depicted embodiment, the end wall 1366 is coupled to legs 1372a, 1372b which fit into rails 1374a, 1374b, 1374c, 1374d, to permit sliding movement in an engagement direction 1376a or disengagement 1376b direction.

Springs 1374a<sub>1378a</sub>, 1374b<sub>1378b</sub>, normally urges the legs 1372a, 1372b, and thus the wall 1366 in the engagement direction 1376a. The springs 1378a, 1378b are sufficiently strong to securely maintain the trommel assembly 1338 in the engaged position (i.e., the position shown in Fig. 13) during normal operation, but permit the output portion 1309-1308 to be moved in the disengagement direction 1376b manually (i.e., without the use of special tools, preferably without the use of any tools) in an amount sufficient to prevent disengagement and withdrawal of the trommel assembly 1338, e.g., for maintenance, cleaning, replacement, inspection, and the like. Preferably, a limit screw 1377a, 1377b provides a stop to prevent the force of the springs 1378a, 1378b from causing the bearing 1360 to thrust against the end cap 1318, undesirably increasing friction. In the depicted embodiment, the tray 1382 is formed in two portions 1382a, 1383b, coupled in a sliding fashion to permit the tray to be collapsed in a direction 1385. Collapsing the tray is believed useful in assisting in tray removal, for certain configurations, e.g., where space is restricted. Preferably the tray 1382 has sufficient capacity that tray emptying is required no more often than about once every two weeks, during normal anticipated use. Other fashions of permitting disengagement or movement of the bearing ring 1360 can be used, such as providing for hinged or pivoting movement. The depicted sliding movement is believed to permit removal of the trommel 1338, e.g., through the open bottom 1382 of the frame, while reducing or minimizing longitudinal space requirements. In the depicted embodiment, and an output chute 1374 is provided adjacent the output opening of the trommel. In the depicted configuration the output chute 1374 is configured to direct coins, output from the trommel, in a substantially downward direction 1320. A tapered region 1378 assists in directing the coins.

Preferably, a tray or other container 1382 is located beneath the trommel assembly 1338 to catch dirt which passes through the trommel dirt openings. Preferably, the tray 1382 is configured to be easily removed (e.g., for emptying, cleaning, and/or permitting access to the underportion of the device). In the depicted embodiment, the first edge 1384 of the tray 1382 engages a rail or lip 1382-formed on the frame 1368, and the opposite edge 1386 may be rotated upward to engage with spring clips 1390a, 1390b on the opposite side of the frame.

On page 11, starting at line 3 and continuing through page 12, line 2:

In operation, the user of the embodiment of Figs. 13-21 places a mass of coins, preferably all at once (typically accompanied by dirt or other non-coin objects) in the input tray 1402. The user is prompted to push a button to inform the machine that the user wishes to have coins discriminated. Thereupon, the computer causes the input gate 1324 to open (via solenoid 1326) and illuminates a signal to prompt the user to begin feeding coins. When the gate 1324 is open, the motor 1352 is activated to begin rotating the trommel assembly 1338. The user moves coins over the peak defined by the hinge 1414, typically by lifting the tray 1402 at least partially, and/or manually feeding coins over the peak 1414. The coins pass the gate 1396 (typically set to prevent passage of more than a predetermined number of stacked coins, such as by defining an opening equal to about 3.5 times a typical coin thickness). The coins move down the first trough 1310, where the pins 13221322a and 1322b prevent passage of certain long objects such as lottery tickets and the like. A long object trap (if any) prevents passage of other types of objects such as popsicle sticks. Coins continue to flow down the second trough or chute 1312. Coins travel through the chute collar mouth 1334 and into the interior of the rotating trommel assembly 1338. Within the rotating assembly 1338 the coins are lifted and free-fall, at least partially, through the interior of the trommel, preferably at least partially in response to provision of flat surfaces, corners, and/or vanes within the trommel. As the coins free-fall or are otherwise agitated by the rotating trommel, dirt particles or other non-coin objects pass through the holes of the trommel and fall into the tray 1382. Coins travel through the trommel, e.g., in response to angled disposition of the vanes and the inclination of the trommel, if any. In general it is believed that a larger angle provides for shorter residence time, but less thorough cleaning or lifting of the coins. Thus the angle selection may require a compromise between the desire for thorough cleaning and the desire for short residence time (which contributes to higher throughput). The depicted configuration, when the trommel rotates at about 36 RPM, and using a typical mixture of U.S. coins, provides a coin residence time of approximately 10 seconds. Under these conditions, throughput during normal use is believed to be sustainable at about 600 coins per minute or more. Configuration and operating conditions can be adjusted to increase or decrease throughput, e.g., by changing the size, length or capacity of the trommel, increasing rotation rate, changing vane configuration or angles, and the like,

within structural constrains for desired durability, lifetime and maintenance costs. The coins, after being at least partially cleaned, exit the second opening 1364 of the trommel, and are directed by the output chute 1374 in an output direction 1320 toward downstream components such as the hopper of a coin transport/discrimination device.

Preferably, operation of the device is monitored, such as by monitoring current draw for the motor ~~1352~~1338. In this configuration, a sudden increase or spike in current draw may be considered indicative of an undesirable load and/or jam of the trommel assembly 1338. The system may be configured in various ways to respond to such a sensed jam such as by turning off the motor 1352 to stop attempted trommel rotation and/or reversing the motor, or altering motor direction periodically, to attempt to clear the jam. Jamming or undesirable load can also be sensed by other devices such as magnetic, optical or mechanical sensors. In one embodiment, when a jam or undesirable load is sensed, coin feed is stopped or discouraged, e.g., by closing gate 1324 and/or illuminating a "stop feed" indicator 1328b.

On page 12, starting at line 15 and continuing through line 24:

Preferably, openings ~~318~~326 are as large as possible to accommodate large non-coin matter without undesirably diverting or hindering the feed rate of smaller diameter coins. A number of factors may affect the choice of hole sizes. As described below, internal vanes, fins, ridges and other projections may be positioned, e.g., on the inside surface of the cylinder, and there must be sufficient remaining surface to allow these projections to be attached and/or formed. The size of the holes and/or the spacing and/or pattern of the holes may affect the strength or load capacity of the cylinder 318. Removing non-coin debris is important, and having a large amount of open surface area (total surface area of all holes in the cylinder 318) tends to increase the effectiveness of eliminating large objects, including large, dense and/or odd-shaped objects. However, the total area occupied by holes in the drum, while being desirably as large as feasible, should not be so large as to cause the cylinder to lose structural integrity, having a small than desired load capacity, and/or be subject to unwanted deflection or failure.

On page 13, starting at line 31 and continuing through page 14 line 2:

A number of devices for accommodating rotation of the tumbler 318 can be used. The tumbler assembly may be supported by a pillow block 702 (Fig. 9~~7~~), a roller-

supported 704a, 704b, 704c end cap 706, or may be provided with rollers or roller bearings 502a, 502b, 502c, or a bracket engaging a race or annular recess 504, or other bearing surface 708. If desired, one or more rollers 502a may be pivotable or spring loaded 524, e.g., to accommodate installation or removal of the cylinder 318, e.g., for maintenance, repair, inspection, and the like. It is particularly desirable that the tumbler be configured for ease of removal so that it can be easily cleaned or replaced or jams may be cleared.

On page 14, starting at line 28 and continuing through page 15, line 8:

In one embodiment a low back-pressure air transfer system may be used. In this system, a fan is mounted adjacent the coin-exit end of the tumbler 344, and a suction hose is positioned adjacent the coin-input end 342. The intake end of the suction hose may be screened or filtered to avoid damage to fans or other devices that power of the suction. Preferably there is little back pressure in the system and a relatively large amount of air is moved through as the coins are tumbled. In one embodiment the perforated cylinder 326318 is enveloped and sealed with a housing to assist in directing air flow in the desired counter-current direction 334. The housing may be in the form of a semi-cylinder covering which seals with a waste removal tray 338. Such a housing preferably also is useful in diminishing or deadening the noise of the tumbler device.

In one embodiment the system is substantially modular such as being contained, along with a feed tray 1402, in a rectangular or other modular housing-312. Preferably the modular design is configured to accommodate retrofitting in devices which do not currently have a tumbler. For example, a device such as that depicted in Fig. 1 may be retrofitted by removing the rectangular housing depicted in Fig. 2 and replacing with the rectangular modular unit of Figs. 8 through 11. In one embodiment the tubular tumbler is formed from two semi-cylindrical mating polyurethane components.

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FIG. 1

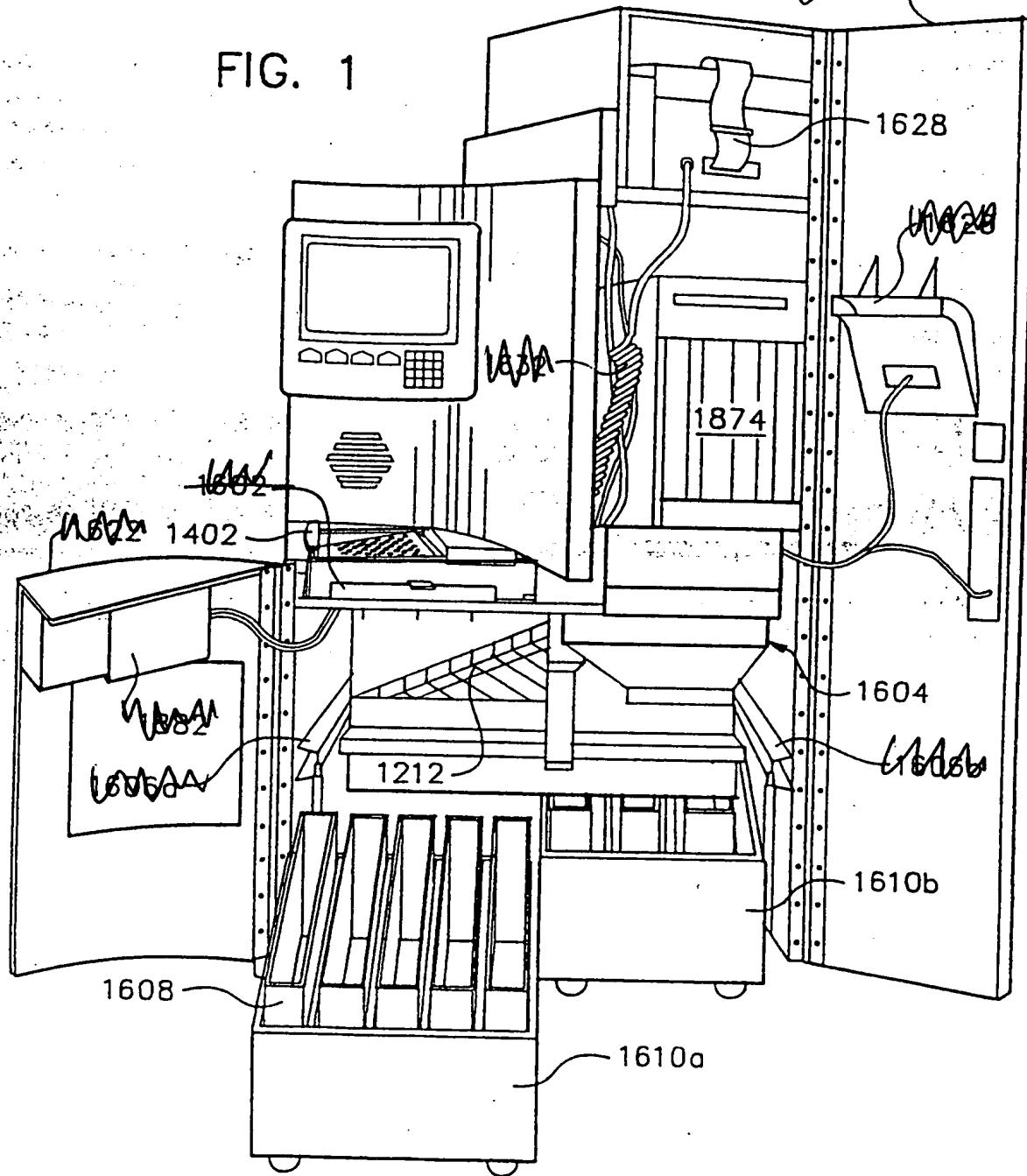
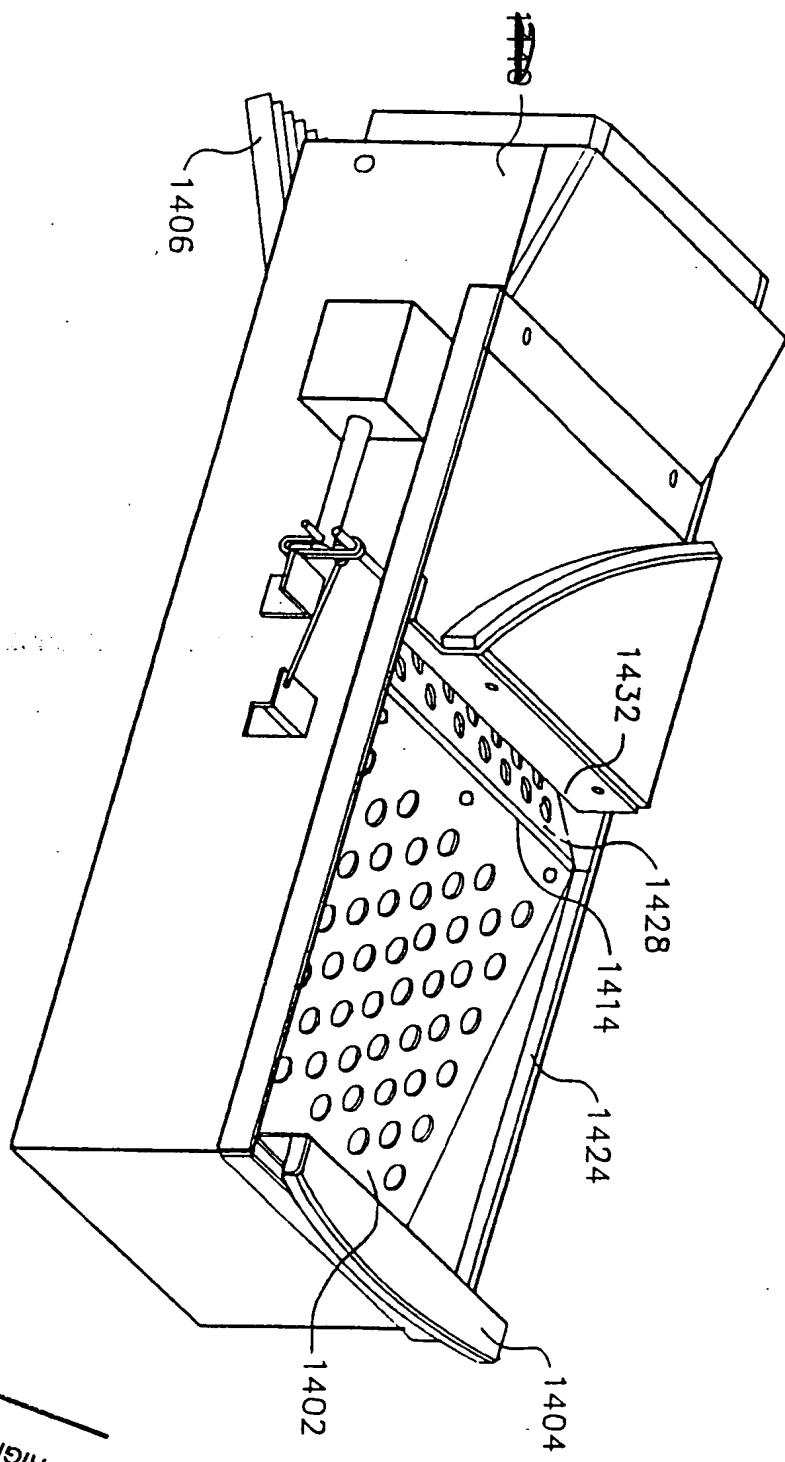


FIG. 2



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FIG. 3

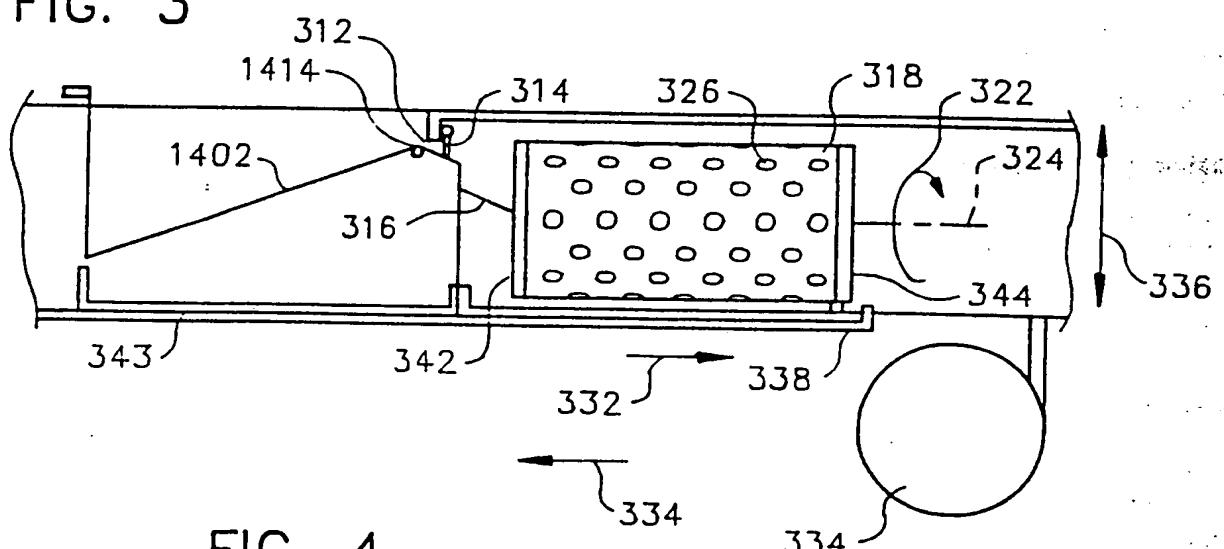


FIG. 4

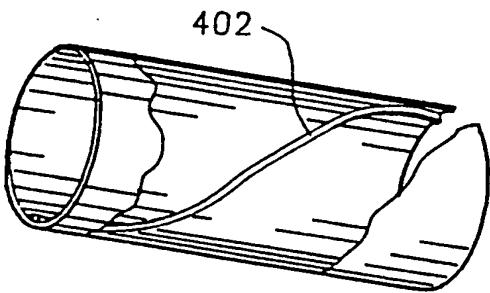


FIG. 6

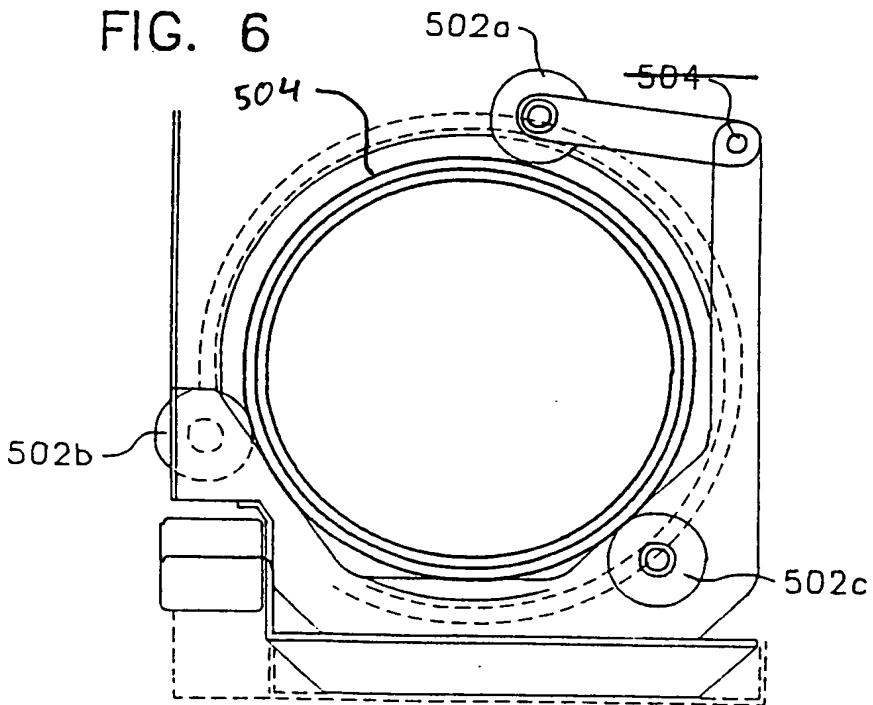
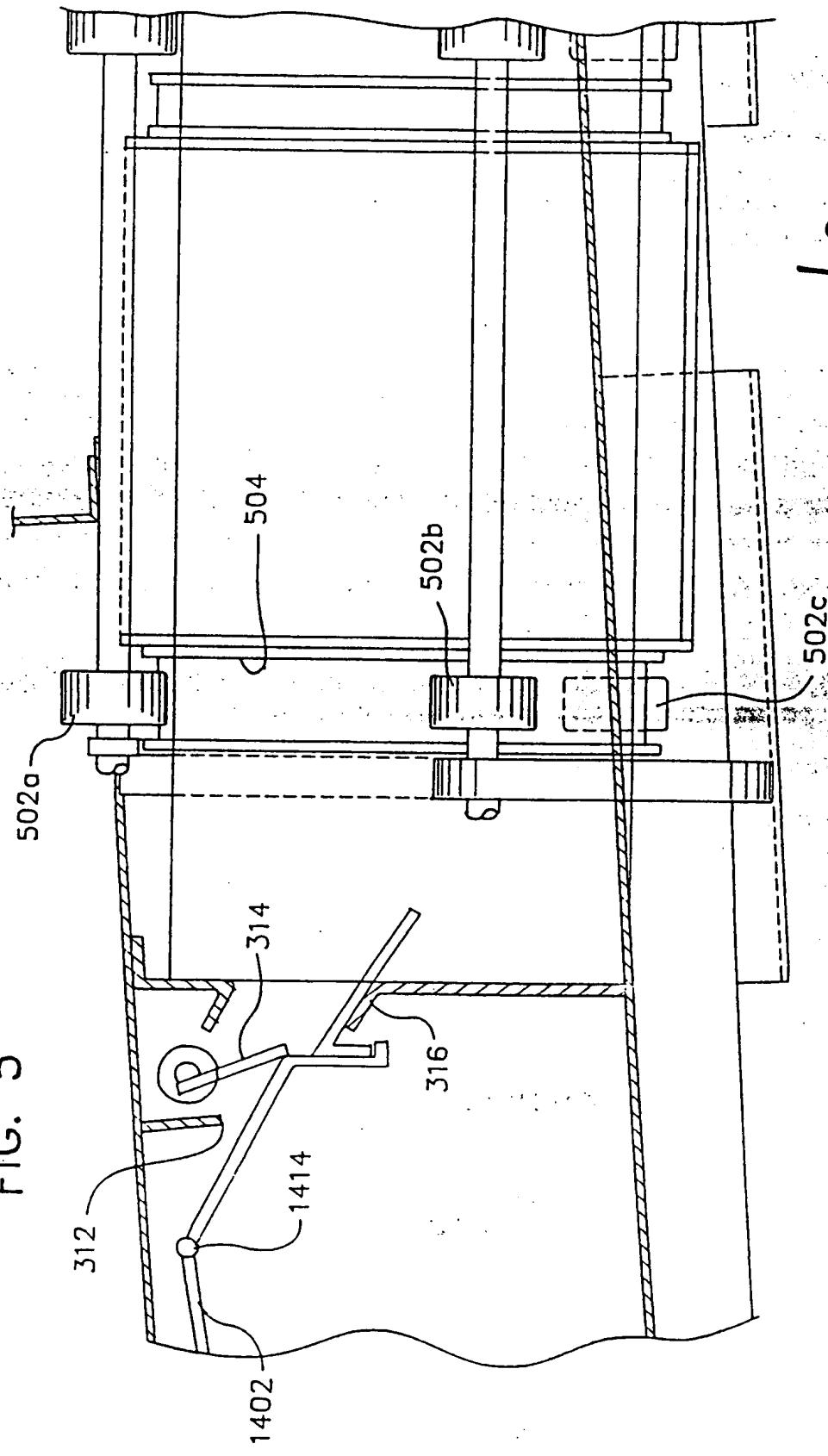
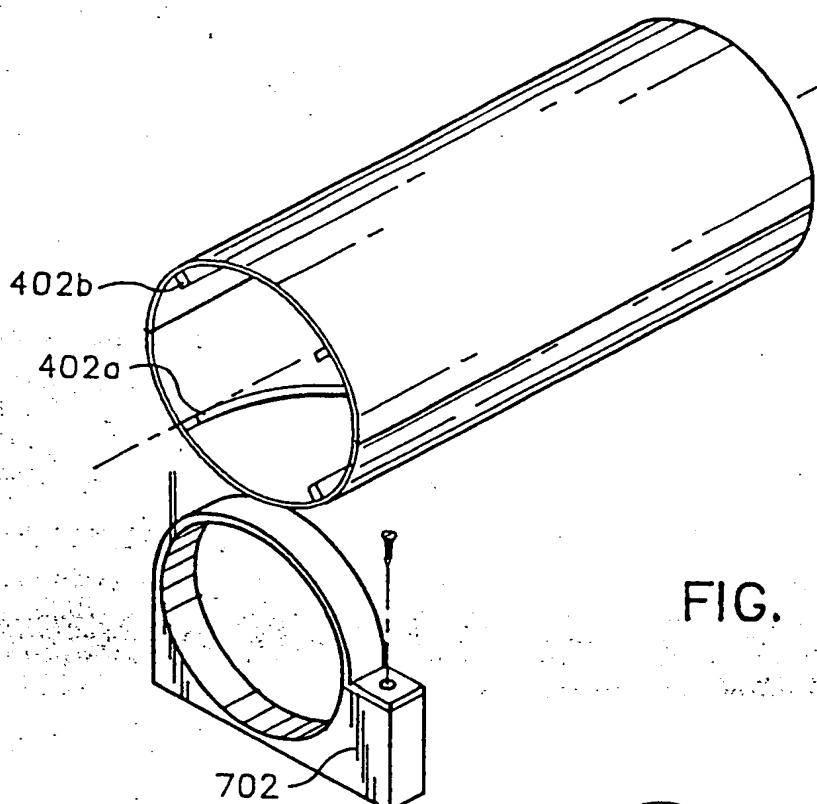


FIG. 5



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FIG. 7A



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FIG. 8

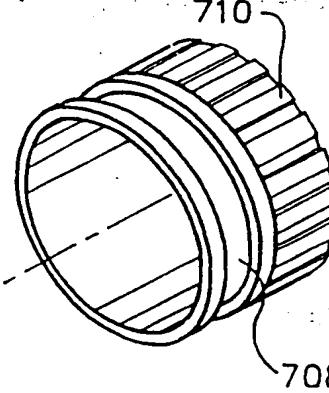
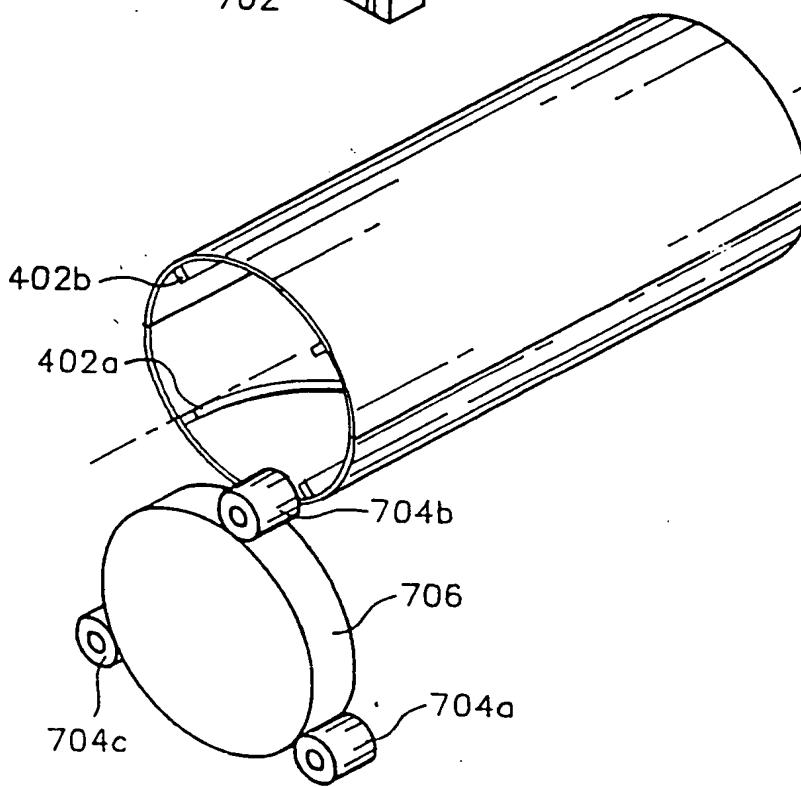
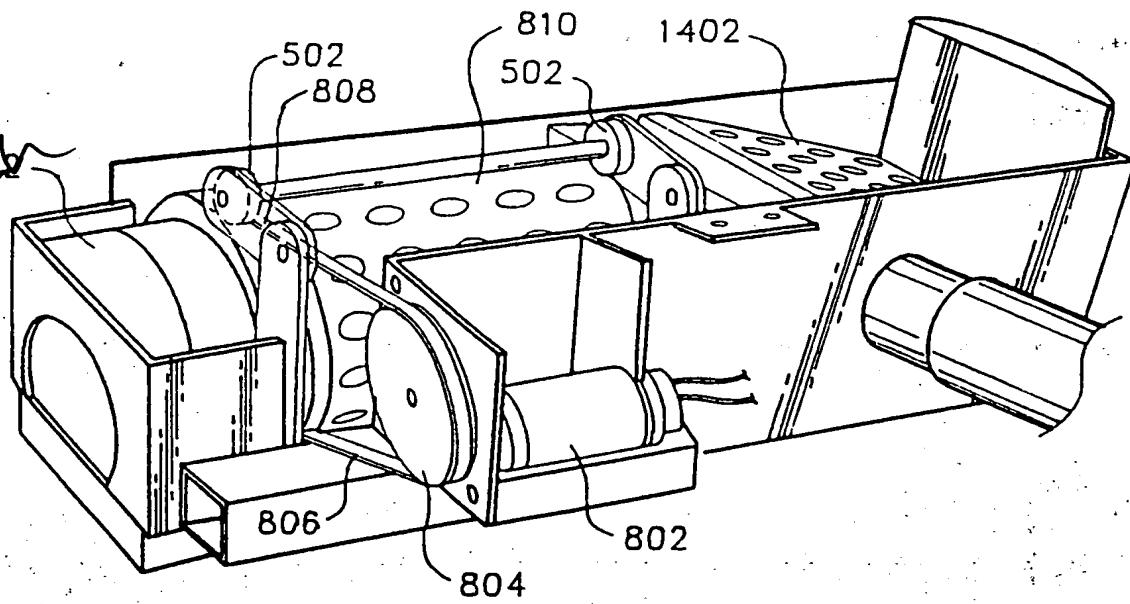


FIG. 9



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FIG. 10

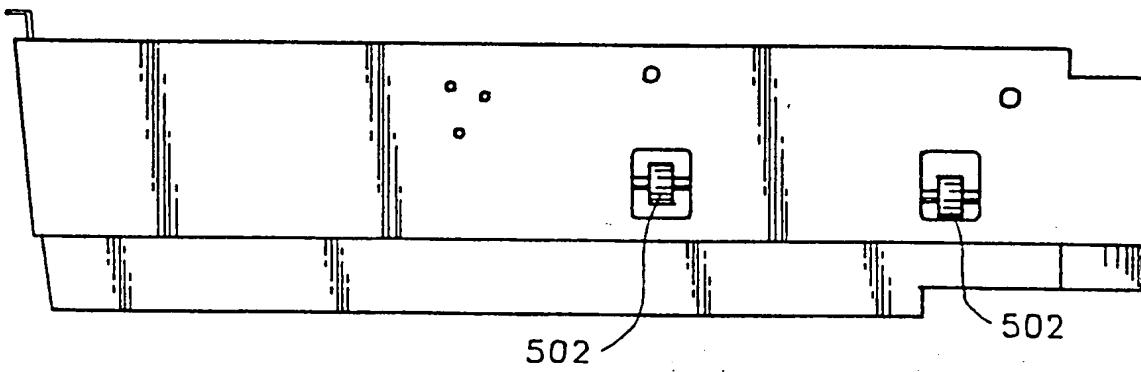
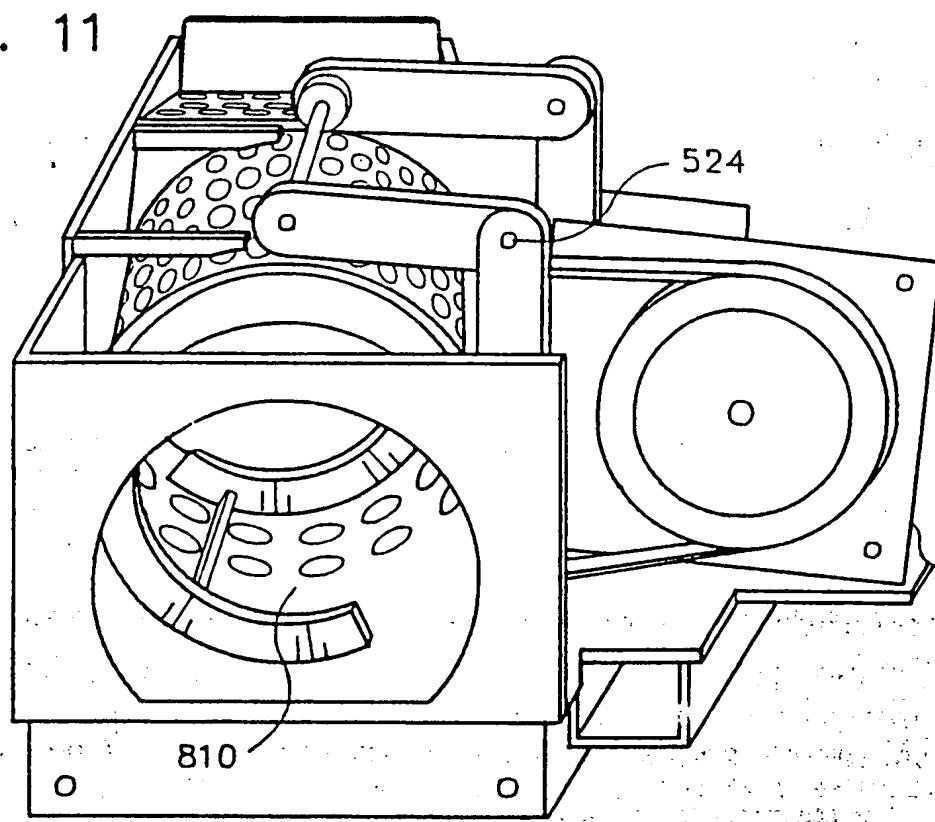


FIG. 11



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FIG. 12

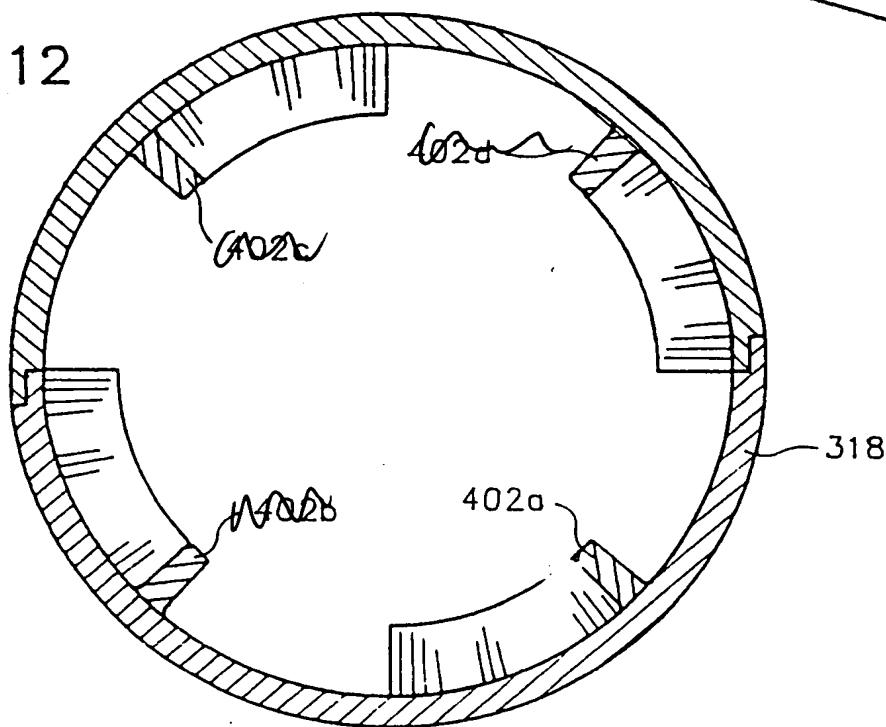
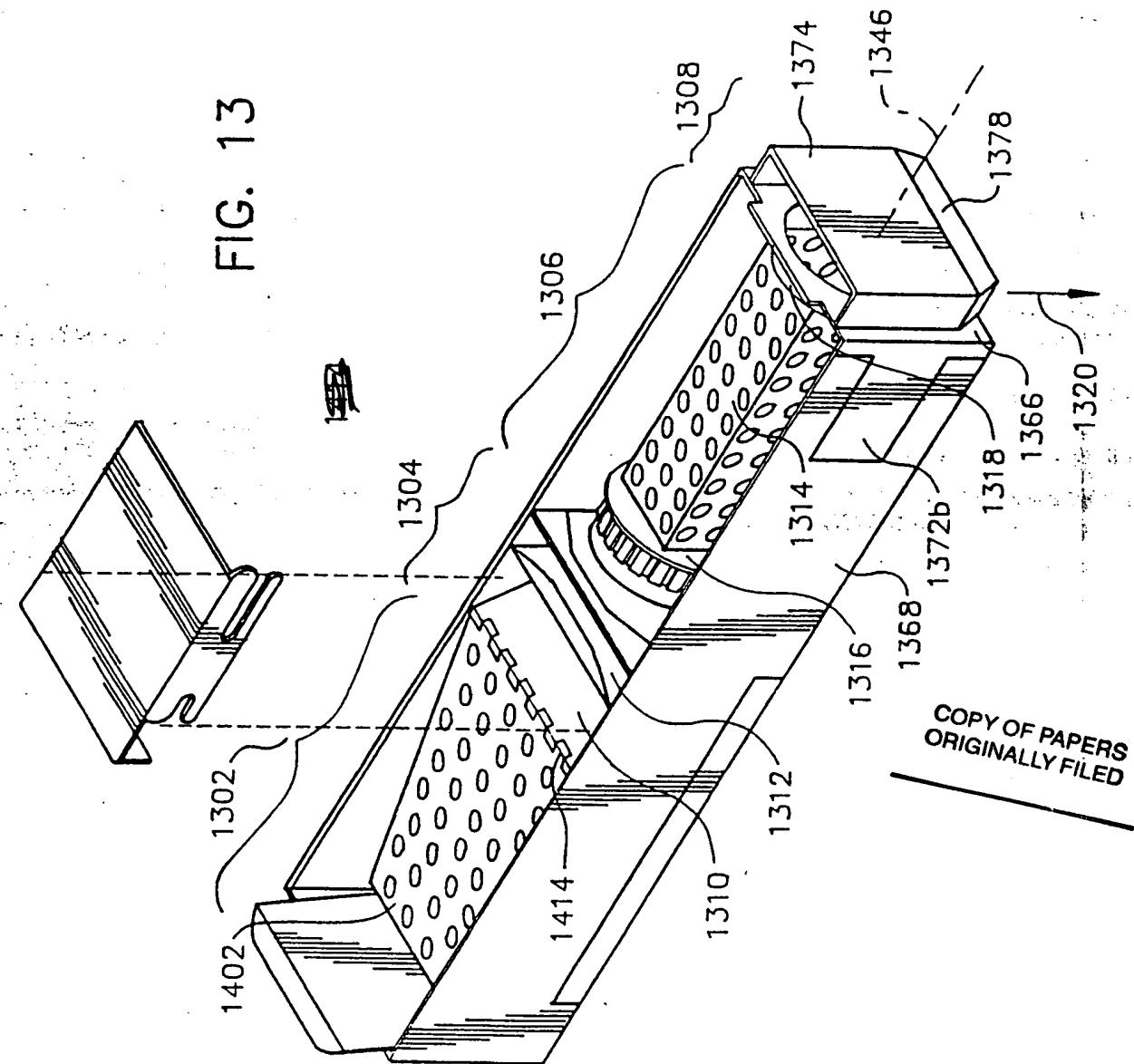
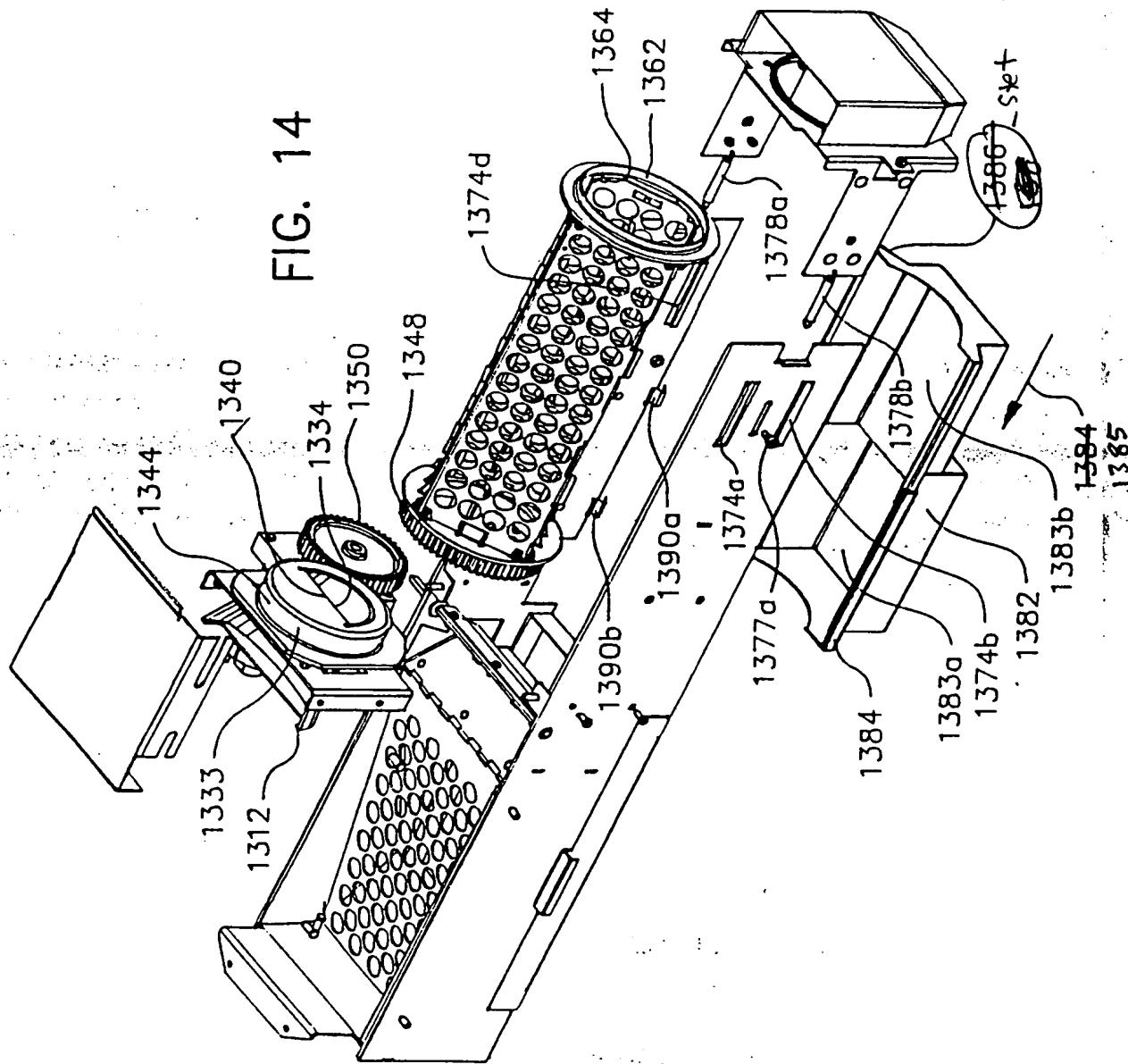


FIG. 13



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FIG. 14



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FIG. 15

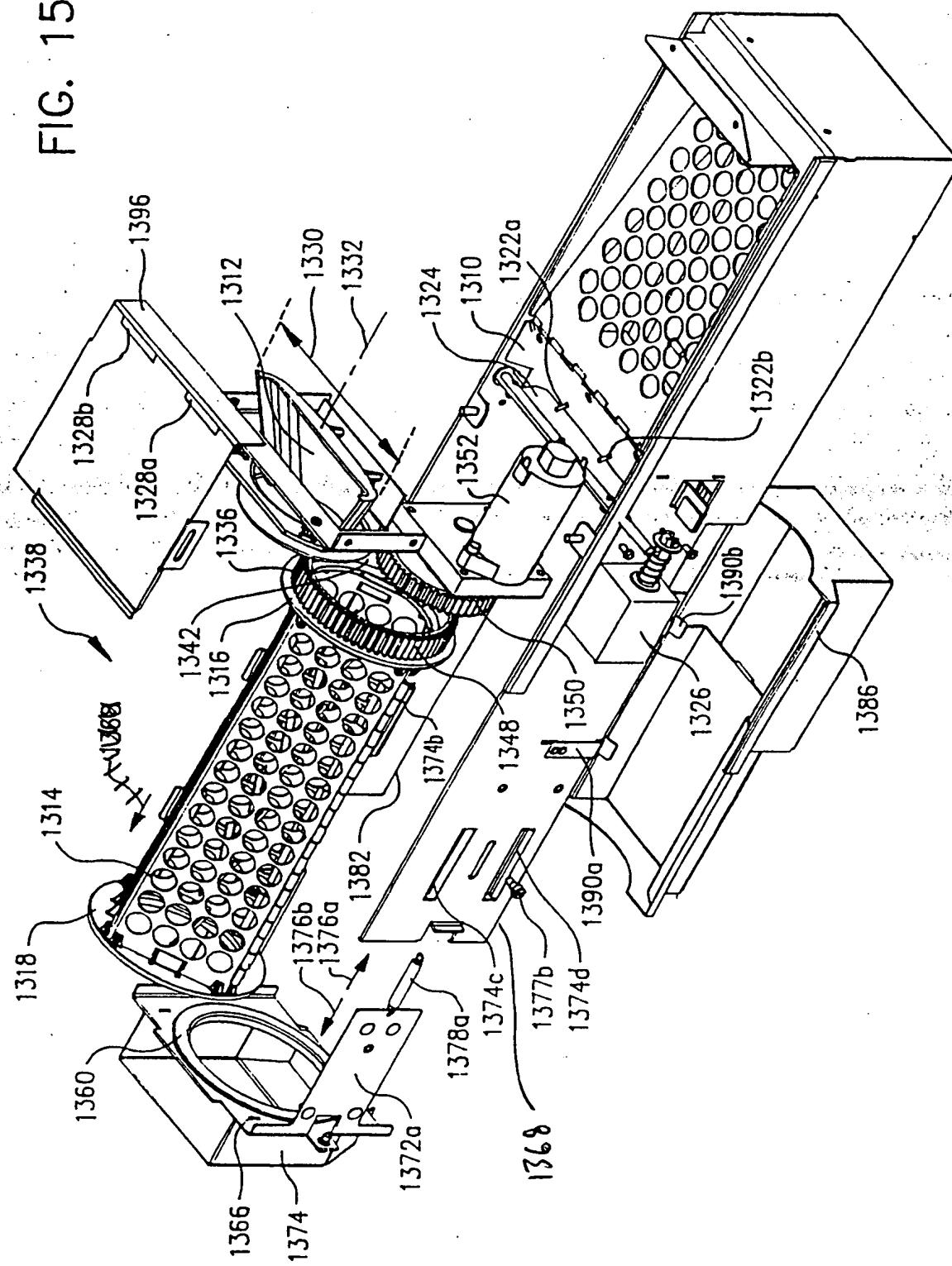


FIG. 16

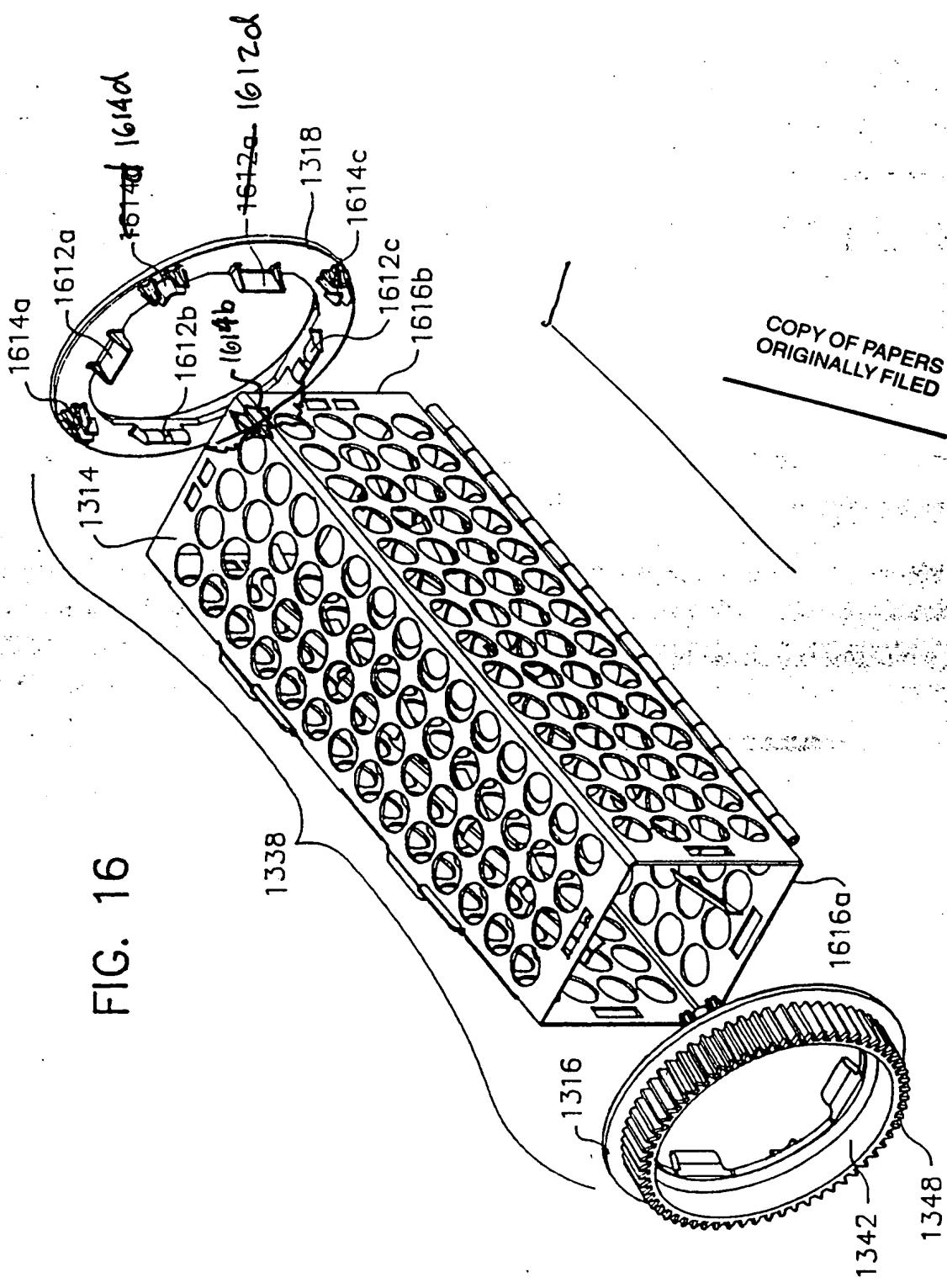
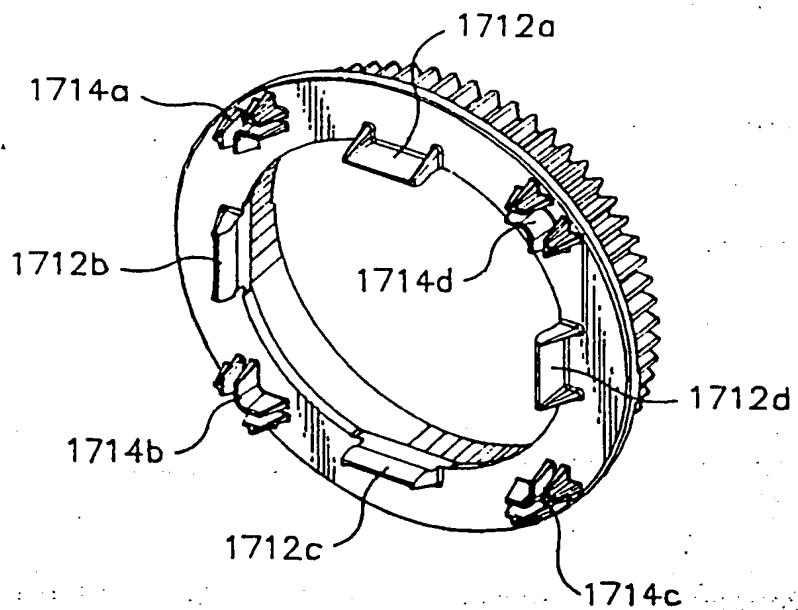
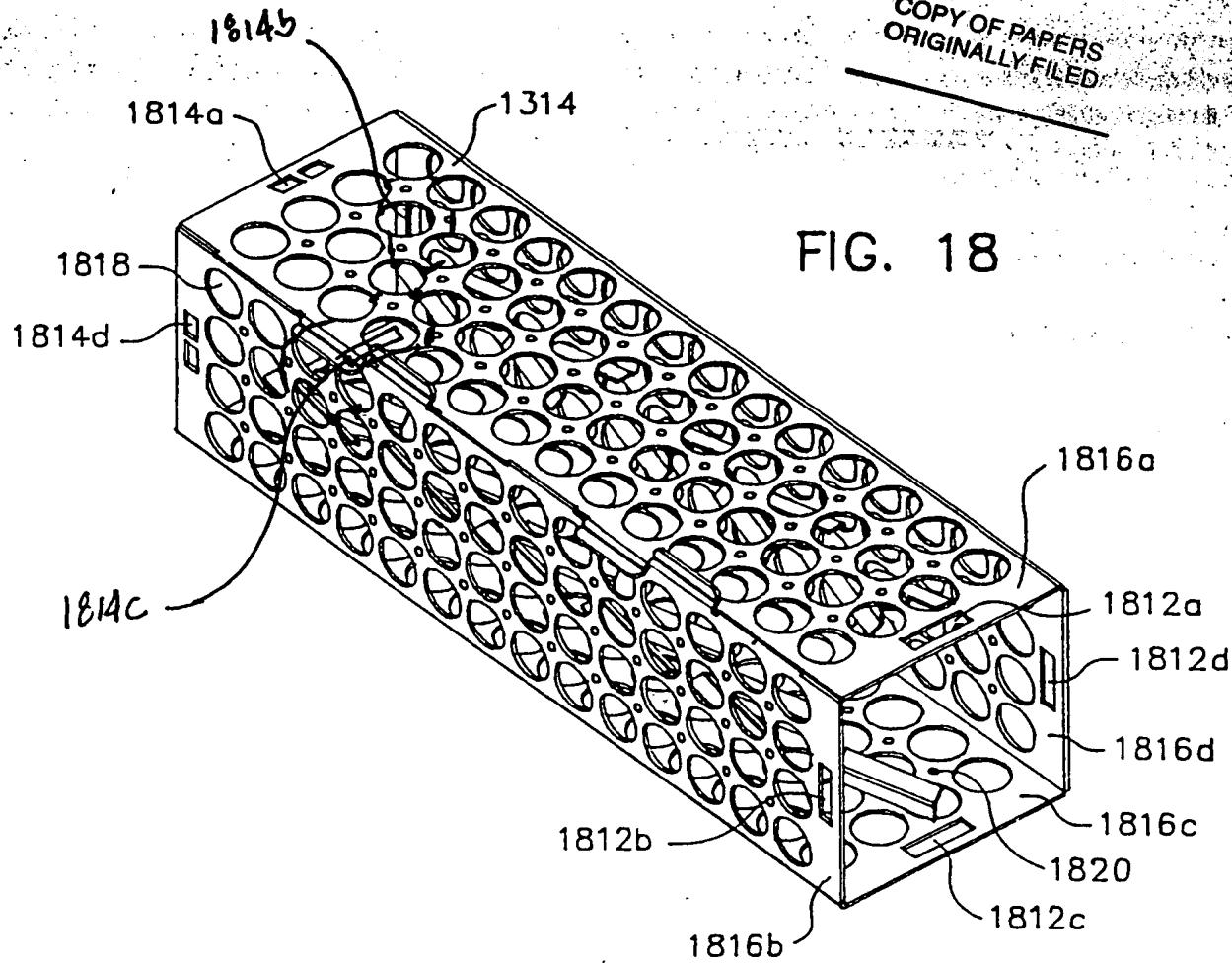


FIG. 17



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FIG. 18



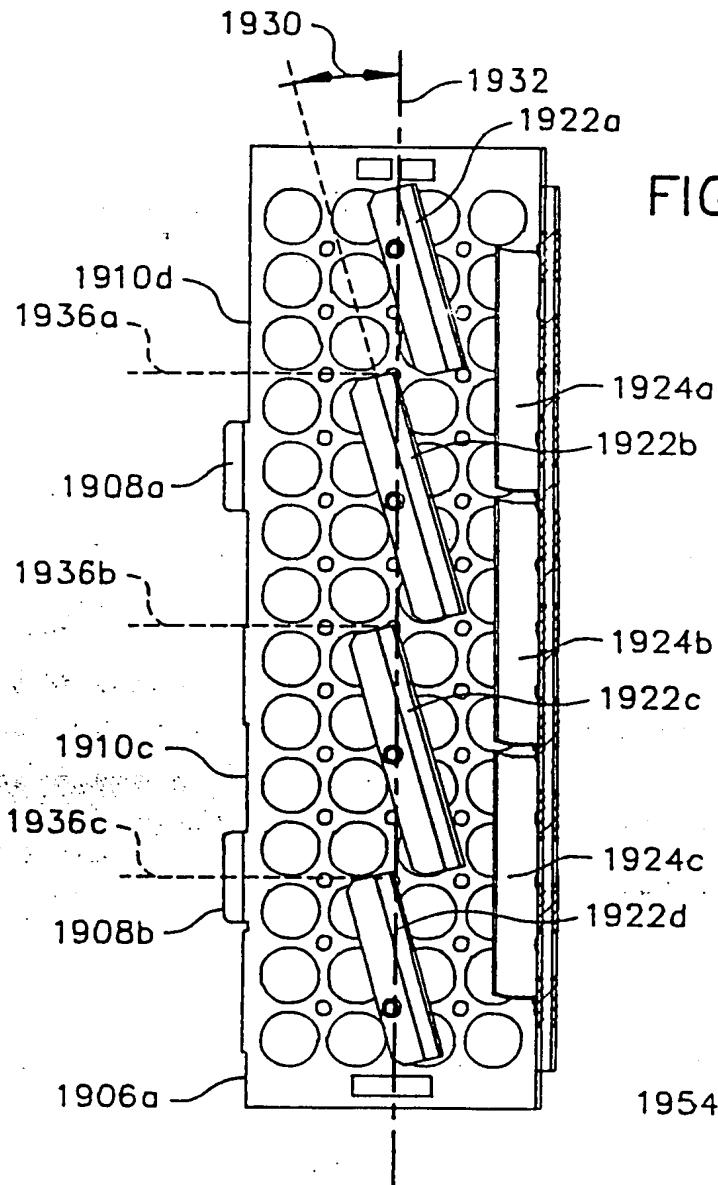


FIG. 19A

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FIG. 19E

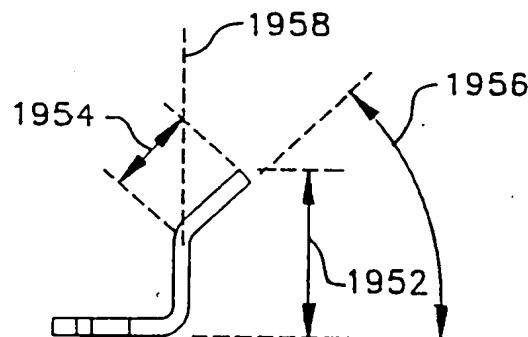


FIG. 19D

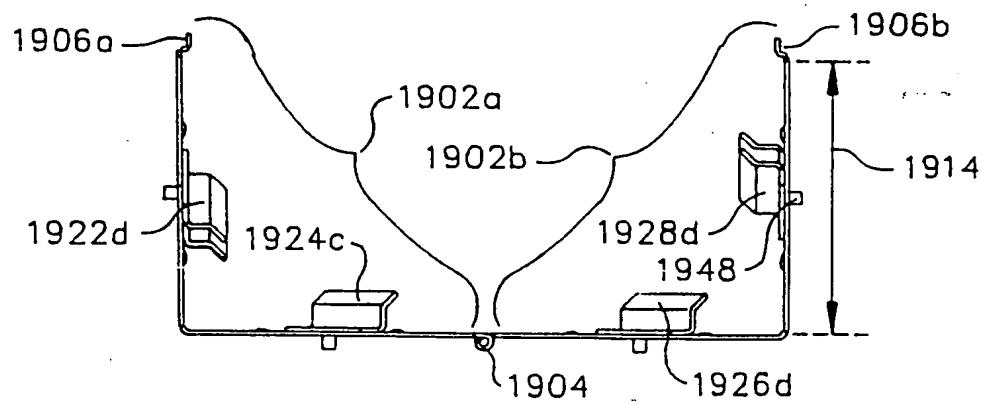


FIG. 19B

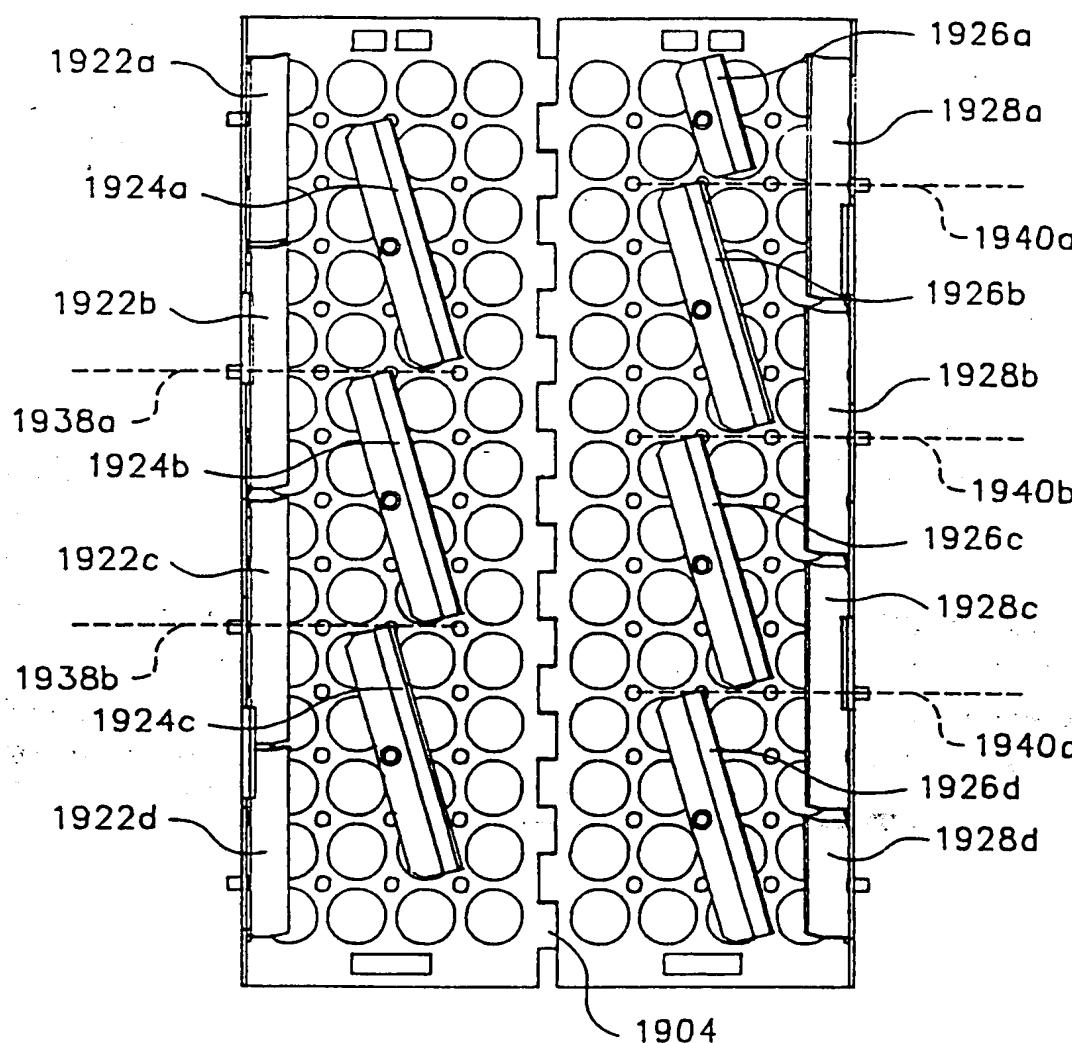
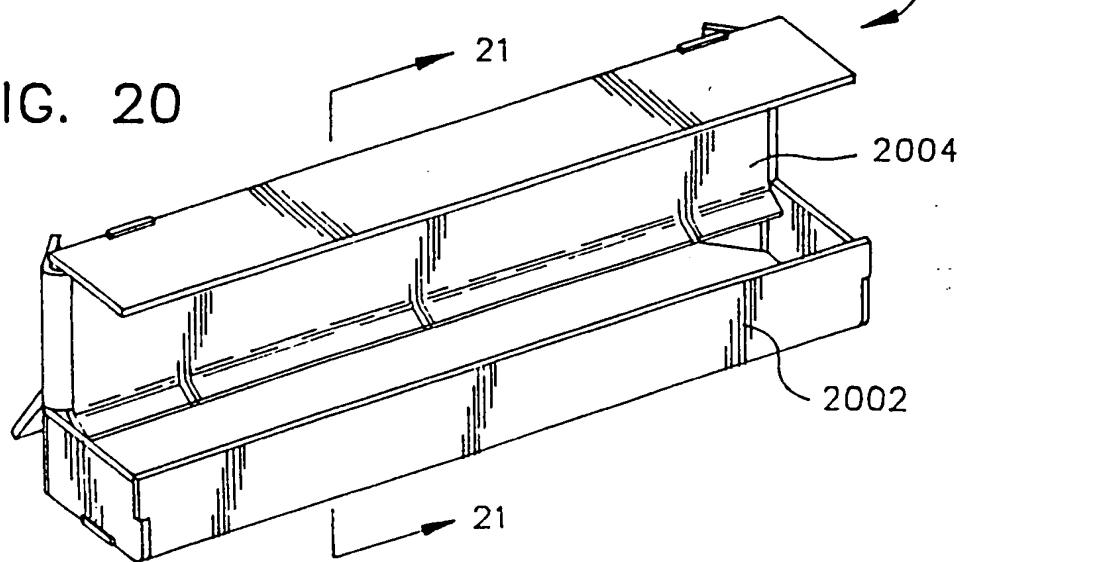


FIG. 20



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FIG. 19C

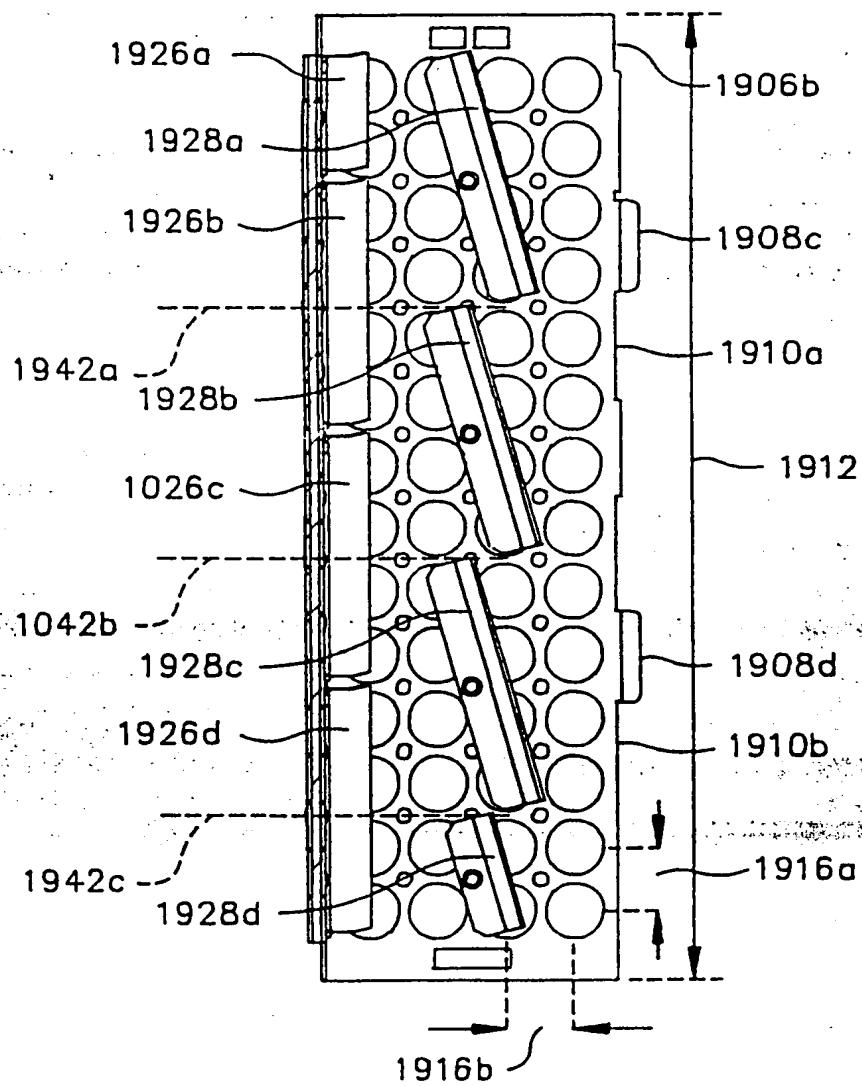


FIG. 21

